

Exploration on the Optimization of Emergency Engineering Management Process in Construction Enterprises

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Abstract: Taking the emergency project management of construction enterprises as the research object, aiming at the problems existing in the current management process, this paper puts forward a process optimization scheme based on benchmarking, ESIA analysis and PDCA and SDCA cycle. Through case analysis, the problems such as too complicated management chain, mismatch between decision-making process and emergency demand, insufficient talent reserve and poor resource organization are identified. Through process optimization, enterprises can better cope with emergencies, improve emergency response speed, ensure the timely delivery of projects, reduce quality and safety risks and control costs.

Keywords: construction enterprises; emergency engineering management; process optimization; risk measures

Introduction

In construction enterprises, emergency project management is facing complex challenges and pressures, especially in the context of frequent emergencies. The purpose of this paper is to discuss the optimization of emergency project management process in construction enterprises. By identifying the shortcomings in the current management process, an optimization scheme based on benchmarking, ESIA analysis and PDCA and SDCA cycle is proposed. The optimized process will effectively improve the emergency response speed, ensure the timely delivery of the project, and reduce the quality and safety risks, thus enhancing the core competitiveness and sustainable development ability of the enterprise.

1 Emergency Project Management Related Theory

1.1 Emergency Management

Emergency management is a comprehensive management activity aimed at public emergencies and public safety risks, aiming at reducing the loss of life, health and property caused by emergencies. China's emergency management system began to fight against SARS in 2003. In 2005, the National Overall Emergency Plan for Public Emergencies was issued, and in 2007, the Emergency Response Law was promulgated, gradually forming a management system with emergency plan as the core. These measures laid the foundation for the response to emergencies such as Wenchuan earthquake, Yushu earthquake and COVID-19 epidemic, and promoted the in-depth study of emergency management theory, system and risk management.

1.2 Emergency Project Management

Emergency projects are measures taken by the government or other organizations to prevent the loss of life and property under major hidden dangers or special circumstances. These projects cannot be completed in time according to normal construction procedures. Emergency engineering is unique, one-off, sudden and risky, and is usually led by the government. Its management characteristics include emergency response, risk, complexity, integration and compulsion. Therefore, it needs to adopt the exception management method in modern project management theory, to ensure that on the premise of ensuring quality and safety, delivery on time is the main goal, and organization and coordination are the core content, while taking into account cost control.

1.3 Business Process Management

Business process management (BPM) is a method to describe, understand, organize and maintain business in internal and external event environments through a series of interdependent processes. BPM is customer-oriented and emphasizes dynamic management, which mainly includes four stages: process modeling, implementation, evaluation and improvement. BPM emphasizes the continuous adjustment and optimization of business processes, organizational structures and information systems, thus forming a complete business process management cycle^[2].

1.4 Process Optimization Method

(1) Benchmarking aiming method

Benchmarking is a management theory and method, which aims to identify and develop excellent products, services, designs, equipment,

processes and management practices to improve organizational performance. In terms of process optimization, enterprises find their own gaps and constantly improve their management processes by comparing with their peers with outstanding performance. It is helpful for enterprises to understand their own situation, identify the advantages and disadvantages of competitors, determine the best process, and effectively integrate it into business management. For construction enterprises, this method is helpful to shorten the development cycle, reduce costs, improve product quality, improve responsiveness and promote product innovation.

(2) ESIA analysis method

The purpose of ESIA analysis is to reduce the non-value-added activities in the process and optimize the core value-added activities. Its steps include elimination, simplification, integration and automation. By using ESIA analysis method, enterprises can continuously improve their processes, remove or simplify redundant examination and approval links, innovate their working methods and enhance their sense of responsibility. At the same time, simple and repetitive information work is handled by computer information system to adapt to the new environment and objectives, thus improving internal operation efficiency and external competitiveness.

(3) PDCA cycle

PDCA cycle is a management method proposed by shewhart and popularized by Deming. Its four steps include planning, execution, inspection and disposal. When the management process is implemented, the established process should be strictly followed, and at the same time, inspection and analysis should be carried out to

improve and optimize the results, and the improved new process should be applied to the next cycle.

(4) SDCA cycle

SDCA cycle, namely standardization maintenance, includes four steps: standardization, execution, Check and Action. The purpose of this cycle is to update all processes related to the improvement process, ensure its balanced operation, ensure the accuracy of the process through inspection, and finally make reasonable analysis and adjustment to meet the expected requirements.

2. Problems Existing in Emergency Project Management Process

Taking ZJJT Company as an example, this paper finds the following problems in the emergency project management process through combing.

(1) The management chain is too cumbersome.

In emergency management, this system is too lengthy and the feedback is not timely enough. The daily management of the project relies on OA office platform, cloud building network and financial information integration platform to realize network approval. The normal approval process needs at least 10 people, and when it involves multiple departments, the number of people will be more, and the processing time may exceed 20 working days.

(2) Decision-making procedure does not match with emergency demand.

Undertaking emergency projects is usually a political task. In case of emergency rescue and disaster relief, enterprises must give priority to the safety of people's lives and property. For example, during the COVID-19 epidemic in Wuhan in 2019, the task of "building the Vulcan Mountain Hospital in 10 days" required rapid decision-making, not a long approval process.

Therefore, the decision to undertake conventional projects is redundant and becomes a manifestation of formalism. In the project implementation stage, the decision-making of major issues also needs to go through complicated hierarchical examination and approval, which is obviously not applicable in emergency projects.

(3) Inadequate preparation of talents

In terms of emergency engineering, taking an isolated medical observation site in Jining as an example, the project needs to start in a short time after receiving the instruction. Sub-enterprises mainly lead the on-site war supervision, and temporarily transfer management personnel, but this practice leads to the stagnation of other project management affairs, resulting in greater costs. Therefore, the current management system can not meet the needs of emergency projects for managers to respond quickly. Emergency projects usually rely on leadership on-site command and temporary deployment, but this may affect the performance of other projects.

(4) Resource organization is not smooth.

The smooth implementation of the project requires a variety of resources such as human resources, labor, materials and machinery and equipment. Companies usually have managers through the project department and obtain other resources through subcontracting and cooperation. Bidding is the key link for resources to enter the market quickly. According to the company system, projects that fail to fulfill the bidding procedures are not allowed to enter the site for construction, and violators will be punished.

3 Emergency Project Management Process Optimization and Scheme Design

3.1 Principles of Establishing and Optimizing Emergency Project Management Process

The overall management principle of emergency engineering management aims at preventing and mitigating the impact of unexpected events, and at the same time effectively preventing the operational risks of enterprises. The management process covers prevention in advance, control in the process and evaluation afterwards. Due to the suddenness of emergency events, the preparation in advance is often not sufficient, so the mandatory orders of the government and the urgent mobilization of resources from all sides are needed. All participants should pay attention to communication and coordination to ensure the transparency and effective connection of information. Improving the management level is the key to optimize the emergency management process. By solving internal management contradictions and clarifying the responsibilities of various departments, information and resources can be shared, decision-making mistakes and duplication of work can be avoided, and the institutionalization and standardization of management can be promoted.

3.2 Establish and Optimize the Emergency Project Management Process

(1) Process adjustment based on benchmarking.

Optimize emergency projects by benchmarking: First, learn from existing processes, sort out efficient and practical management processes, keep effective steps, and delete inapplicable and redundant parts; The second is to transplant internal experience, summarize effective

practices based on emergency project management practice, and institutionalize them to form a standardized process; The third is to set internal objectives. On this basis, the emergency project centered on "on-time delivery" is put forward, and on this basis, all links are constantly adjusted to ensure the smooth completion of the project. Secondly, in terms of external benchmark orientation, there are mainly the following aspects: first, we should formulate an external goal to organically integrate the emergency project management process of enterprises with the government's emergency management system to ensure that the two can be well combined, so as to achieve the government's management objectives; The second is to compare with the management process of excellent construction units in the industry, analyze their advantages, learn from their successful experience, and identify their own shortcomings, so as to optimize the management process, enhance their competitiveness, and then improve their own management level.

(2) Process optimization based on ESIA analysis.

ESIA analysis involves four core steps to optimize the emergency project management process: perfection, elimination, simplification and integration. First of all, according to the characteristics of emergencies, it is improved, the emergency plan system is constructed, the bidding process is optimized, and the project management and decision-making process are reorganized. Secondly, eliminate non-value-added activities, eliminate worthless, repetitive or unnecessary processes and approval nodes to reduce resource waste. Then, simplify the process, reduce unnecessary examination and approval links, innovate working methods and improve efficiency.

The integration link requires the reconstruction of emergency management and traditional project management processes to form an efficient whole, which serves all stages of project management. Finally, automation involves the use of computer technology to deal with simple and repetitive work, reduce communication costs and errors, and automatically start the plan process when emergency conditions are triggered. These steps together ensure the efficiency and responsiveness of emergency engineering management [3].

(3) Process improvement based on PDCA and SDCA cycle

On this basis, the emergency project is optimized by benchmarking and ESIA analysis, and then PDCA cycle is applied to the process of emergency project, achieving the goal of continuous improvement. According to PDCA-SDCA method, that is, planning, implementation, inspection, disposal and standardization. PDCA and SDCA cycle complement each other, forming a spiral improvement model, thus continuously improving the management level of the company.

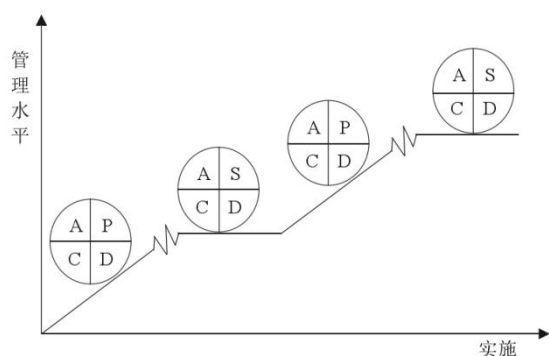


Figure 1 PDCA circulation and SDCA cycle

3.3 Construction and Optimization of Emergency Project Management Process

(1) Emergency plan and preparation

In order to cope with natural disasters, accidents, public health and social security

incidents, it is clearly stipulated that governments at all levels need to establish and improve the emergency plan system, and encourage the signing of agreements with enterprises to ensure the production and supply of relief materials and equipment. Specifically, it is necessary to set up an experienced compilation team to analyze the hazards and emergency response capabilities and formulate targeted plans. In terms of organizational guarantee, special leading bodies should be set up to realize rapid decision-making and establish sufficient talent reserves. In order to ensure resources, it is necessary to optimize the allocation of emergency materials and labor force, and establish a strategic cooperation team and supply unit library. Finally, through extensive publicity and mobilization, ensure the effective implementation of the plan [4].

(2) Task receiving and starting emergency plan

The management of emergencies shall be territorial management. In case of emergency, the state and governments at all levels will follow the established emergency plan. Enterprises should pay close attention to the development of emergencies, and managers and subsidiaries in all regions should keep abreast of the projects under construction and resource allocation in the affected areas and communicate with local governments or relevant institutions in a timely manner. In addition to the normal emergency rescue work, we should also do a good job in the pre-construction of emergency projects to ensure that the emergency plan can be started immediately once the construction task instructions are received.

(3) Establish a special leading body for

emergency engineering construction.

After the emergency happens, the emergency should be classified according to the difficulty and complexity of the project, and on this basis, the corresponding countermeasures and suggestions are put forward. No matter what level of leadership organization, it should be approved by the company's decision-making department in advance to ensure that they have the right to make decisions and are the highest decision-makers in the whole project implementation process, as shown in Table 1.

Table 1 Correspondence between emergency engineering classification management and

professional leading group		
Elements of graded evaluation of emergency projects	Evaluation grade	Composition of specialized leading bodies
The construction is difficult, the technology is difficult, the safety risk is high and the complexity is high.	I	Team leader: general manager Deputy Team Leader: Deputy General Manager and Chief Engineer in charge of each business. Team members: heads of functional departments and sub-enterprises.
At least one of construction difficulty, technical difficulty, complexity and safety risk is big (high)	II	Team leader: deputy manager in charge of performance. Deputy Head: Third Chief Division Team members: heads of functional departments and sub-enterprises.
The construction difficulty is small, the technical difficulty is small, the safety risk is small and the complexity is low.	III	Team leader: the person in charge of the subsidiary enterprise Deputy Head: Deputy General Manager and Third Chief Engineer in charge of each business of subsidiary enterprises. Team members: heads of various functional departments, proposed project leaders.

(4) Quick decision and response

As the highest decision-making body, specialized leading institutions should make timely decisions and respond, set up project organizations, assign project leaders, make

resource demand and investment plans, prepare funds and evaluate risks. All functional departments need to start relevant special plans according to the emergency plan. The human resources department mobilizes personnel reserves to enrich the management team; The project management department formulates the time limit for a project plan; The business management department communicates with the internal team about the labor preparation; According to the bidding results, the materials and equipment department organizes the procurement plan of raw materials and coordinates with suppliers; The finance department is responsible for raising and distributing funds; Engineering quality department is responsible for organizing the formulation of construction plan, and providing technical guidance and quality control for the project.

(5) Establish project organization.

According to the decision of the professional leading group, the project management organization is established, and the project director and the personnel department jointly determine the relevant cadres. The human resources and project management department is responsible for coordinating various departments to ensure that the performance team is in place on time, and quickly set up an emergency project performance team to provide grass-roots organization guarantee for project performance. At the same time, the project manager and the project management organization should be given special powers.

(6) Project performance

Because of its urgency, emergency engineering is different from the traditional project management of "three controls, three pipes and one

coordination". Emergency project management should take delivery on schedule as the primary goal under the premise of ensuring quality and safety, mainly focusing on organization and coordination, while taking into account cost control. During the performance, the company and the project department need to adjust their management concepts and working methods. The emergency project management follows the management process as shown in Figure 2, and the quality and safety process as shown in Figure 3 is used for control during the process of control implementation.

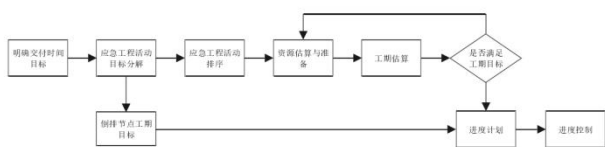


Fig. 2 Schematic diagram of progress management process

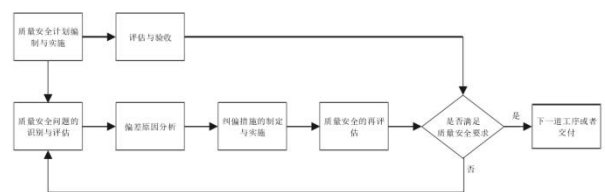


Figure 3 Schematic diagram of quality and safety management and control process

3.4 Effect Comparison Before and After Process Optimization

In order to solve the problems faced by the company in emergency engineering management, a special emergency management process was formulated. This includes optimizing the process of project undertaking decision, management decision and resource guarantee, so as to improve the management level and project performance quality and enhance the core competitiveness of enterprises. By combing the general process of emergency project management, a new project type management framework is formed, which is

connected with the national emergency management system to ensure that the emergency management rules of enterprises are connected with national policies.

The original project management process has performed well in conventional projects, but the emergency project lacks complete contracts, drawings and internal resource guarantee, which makes the traditional process inapplicable. Therefore, the optimized performance management process has established a special leading body, authorized to make quick decisions, and transformed the traditional comprehensive project management model into an emergency management model based on timely delivery, while paying attention to organization and coordination and cost control. In terms of resource organization, considering that the bidding process is lengthy and it is difficult to provide emergency resource guarantee, the company has established an emergency engineering talent pool to quickly set up a performance team when receiving instructions.

4 Risk Prevention Measures for the Implementation of the New Process

4.1 Time limit for A Project Schedule Risk

The primary purpose of emergencies is to ensure the smooth completion of the project, and its greatest risk is that it cannot be completed on time, thus causing incalculable consequences. Therefore, it is necessary to sort out and optimize the new workflow, and formulate the Emergency Project Rapid Response Plan to ensure the rapid response to emergencies. At the same time, an "emergency project reserve team" was established to provide organizational guarantee for enterprises, and a "labor management strategic resource pool" and a "material supply

strategic resource pool” were established to ensure the safety of resources.

4.2 Quality and Safety Risks

In emergency engineering, quality and safety risks are controllable, but due to its particularity, the main goal is to complete delivery as soon as possible under the premise of qualification, so quality defects and safety problems may occur. In order to strengthen risk control, measures such as risk retention, risk substitution and risk transfer can be taken. First of all, the risk retention measures should strengthen inspection and control to deal with the quality hidden dangers caused by rushing to work and compressing the intermittent time of technology, and the construction should be carried out strictly according to the specifications. Secondly, risk substitution measures can reduce construction difficulty and risk by optimizing design and adopting simple and technically mature schemes, such as assembly design. Finally, risk transfer measures need to be communicated with the owner before implementation, so as to reduce unrealistic high-quality targets, clarify quality and safety risks, and make an exemption agreement in the contract^[5].

4.3 Cost control risk

Because of the political imperative and urgency of emergency project, cost control is not the main goal, but enterprises still need to take into account cost management. Emergency projects face the risk of under-estimated cost and over-expenditure. At the beginning of the project, it is necessary to calculate the cost and prepare special funds. If the funds are insufficient, the project will be stagnant. Due to the possible

scale changes in the construction process, the cost estimate should have a redundancy coefficient. Cost overruns mainly come from rising labor and material costs and out-of-control management costs. In order to cope with the rising cost, the company should strengthen contract management to transfer risks through centralized bidding and establishing strategic cooperation with high-quality labor and material units. At the same time, strictly control the number of management personnel and various expenses to prevent management expenses from overspending.

5 Conclusion

In this paper, the emergency project management process of construction enterprises is deeply discussed and optimized. By analyzing the particularity and challenges of emergency engineering, this paper puts forward an optimization scheme based on benchmarking, ESIA analysis and PDCA and SDCA cycle, so as to effectively improve emergency response capability and management efficiency. The optimized management process significantly shortens the decision-making time, clarifies the responsibilities of various functional departments, and establishes an emergency engineering talent pool and resource guarantee system to cope with the uncertainty brought by emergencies. In addition, in view of the risk of time limit for a project, quality and safety and cost control, this paper puts forward corresponding risk management measures to ensure that emergency projects are delivered on time on the premise of ensuring quality and safety. By implementing these optimization measures, enterprises can better cope with emergencies, improve their core competitiveness and achieve

sustainable development.

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